

Summary Report for Florida Review on Nonstructural Precast Concrete Elements

A national review was conducted on nonstructural precast concrete elements in Florida during the week of November 14th. Florida is one of ten states being reviewed to determine if there is a national issue with the quality of nonstructural precast concrete elements. Over this past week, the team reviewed a total of five precast concrete producers in Florida. Two of the producers were located in Florida Department of Transportation (FDOT) District 2 and the other three in FDOT District 5. Three of these producers were third party certified and two were not.

For this review, nondestructive testing was conducted on completed nonstructural precast concrete elements with a pachometer. A total of eleven precast concrete elements at five precast plants were checked using the pachometer to determine if the steel reinforcement was placed in the elements in accordance with the applicable FDOT standard details or approved shop drawings. Ten of the eleven elements reviewed were FDOT products. All eleven elements contained the required steel reinforcement at acceptable spacing and all exceeded the specified minimum cover.

FDOT divides there non-structural precast elements into three categories, drainage, incidental, and concrete pipe each with its own specification requirements. Drainage items include catch basins, manhole covers, drainage inlets, and box culverts while incidental items include sound walls, retaining walls, concrete poles, and traffic barriers. Overall, FDOT has good procedures and processes for providing oversight of the nonstructural precast concrete producers. The team did have some minor observations for the Florida Division and FDOT to consider regarding the FDOT's programs on incidental and drainage precast.

Based on this review, the team is providing observations in the following three categories:

- 1) Successful practices – good procedures the FDOT is currently using for their nonstructural precast concrete elements program.
- 2) Concerns on a national level – observations which could potentially occur nationally and may require further guidance from by the FHWA Office of Infrastructure.
- 3) Observations for potential improvement – areas the Florida Division and FDOT may want to consider improving.

Successful Practices:

Successful Practice 1:

FDOT exhibited an excellence presence at the precast plants in Districts 2 and 5 as follows:

- The FDOT district plant inspector and a representative from FDOT's State Materials Office conduct a thorough review of the producer on an annual basis. The review uses a standard checklist which includes checks on supplier compliance with FDOT specifications and record-keeping requirements.
- In addition to the annual reviews, the FDOT district plant inspectors conduct monthly reviews of incidental precast concrete items and quarterly reviews of drainage precast concrete elements. It was clear to us that the inspectors are knowledgeable of their job

requirements and we were impressed with the documentation provided by their completed checklists.

- FDOT inspectors take core or cylinder tests during their monthly or quarterly inspections depending on the type of nonstructural precast concrete element. For concrete pipe, the FDOT inspector witnesses the three-edge bearing test when compressive strength acceptability of pipe is based on this test. This type of verification testing is a good practice for ensuring producers provide concrete that meets the minimum compressive strength requirements.
- FDOT inspectors check Buy America requirements by ensuring the producer has the mill certifications that match the tags on steel products currently being used in production.

Successful Practice 2:

The producer's quality control personnel conducting sampling and testing are required to be reviewed through an independent assurance review conducted by FDOT's District personnel. The procedures for independent assurance are described in Section 5.5 of FDOT's Materials Manual and include a three strike system.

Successful Practice 3:

Producers are required to submit quality control plans for each of the following nonstructural precast concrete elements: pipe, incidental and drainage. Producers cannot begin production on State products until the FDOT has accepted the plans. The quality control plans must be updated as changes occur to the producer's processes, personnel, mix designs, etc. The quality control plans are reviewed during FDOT's annual inspections.

Successful Practice 4:

FDOT has an excellent system for assuring the competence of the producer's quality control personnel. FDOT's Materials Manual requires specific certifications for the producer's quality control personnel for inspection and sampling and testing, design and verification of concrete mixes, and operation of the batch plant. The producer's personnel qualifications must be included in the producer's quality control plans. Additionally, FDOT's Construction Training Qualification Program allows for electronic tracking of the personnel qualifications.

Successful Practice 5:

The Materials Manual provides the expectations for quality assurance to producers and FDOT personnel and helps to ensure consistency throughout the State. Section 5.6 establishes quality control and process control standards for production and construction operations such as the requirement for the producers to have a quality control plan. Sections 6.2, 6.3 and 8.2 cover the Quality Assurance of precast concrete pipe, precast concrete drainage elements and precast concrete incidental items respectively. These three sections are broken into two volumes, Volume I covering the FDOT personnel's responsibilities and Volume II providing guidance to producers on the manufacture, storage and transportation of precast concrete elements for FDOT projects. Section 9.2 provides guidelines to standardize the activities associated with the concrete production facilities used for FDOT projects.

Successful Practice 6:

FDOT utilizes its Standard Details very well in the production of precast elements. There is a large selection of precast elements. The standard details are updated frequently by FDOT. The

producers are typically following the standard details rather than submitting shop drawings for approval to deviate from the standards.

Successful Practice 7:

FDOT has comprehensive procedures for the acceptance of precast elements:

- Producers are required to provide pre-pour and post-pour checklists along with a shop drawing for each unique precast element (in the rare case where they choose to deviate from the standards). The pre-pour checklist is required to be signed by the producer's quality control personnel prior to pouring. The post-pour checklist is then required to be signed by the producer's quality control personnel upon completion of the element. The standard detail/shop drawing with the approved completed checklists must then be kept with the corresponding lot package.
- Testing and documentation requirements on incidental and pipe precast concrete elements help to ensure the producer has good quality control procedures in place and only products meeting the specifications are provided to FDOT projects.
- Patching and repair work must be completed, and documented, prior to acceptance.
- The Quality Control Manager or their designated technician must stamp the structure.
- A notarized certification of compliance (FDOT 206) must be provided by the producer for the elements produced for each project.
- The list of structures must be included with each shipment of the products to the project site.

Successful Practice 8:

FDOT has good procedures in place for tracking source materials being used in concrete mixes. All mix designs are reviewed and approved for incidental and pipe precast concrete elements. All source materials are required to be on the qualified product list. The aggregate stockpiles are required to be labeled in the field including the supplier and the mine numbers. We observed this at all plants we inspected.

Successful Practice 9:

Florida precast concrete producers and FDOT are part of the Precast Concrete Structures Association of Florida and have quarterly meetings. These meetings allow FDOT to proactively engage with industry.

Concerns on a National Level:

National Observation 1: Verification Testing - FDOT conducts limited verification testing on the completed nonstructural precast concrete elements such as catch basins, walls, manholes, etc. No forms of destructive or nondestructive testing are conducted to verify the required amount of steel is being used in precast concrete elements. FDOT does require core or cylinder tests to be taken by an FDOT inspector during their monthly or quarterly inspection depending on the type of nonstructural precast concrete element. For concrete pipe, the FDOT inspector witnesses the three-edge bearing test when compressive strength acceptability of pipe is based on this test. The team believes the limited amount of verification testing will be a national trend and will be carried forward to the Office of Infrastructure for further consideration of guidance. It should be

noted; FDOT does spot visual inspections on elements at plant site and requires completed elements to be visually inspected for acceptance at the project site.

National Observation 2: Buy America – While all producers appear to be using steel products that were melted and manufactured in the United States, some of the producers were not providing the necessary certifications that they were meeting the Buy America requirements. For two of the five producers, the team was unable to match a tag off a steel product currently being used by the precast producer to a mill certification. While being able to match a tag with a mill certification is a minimum that would be expected from a producer, it is unclear if more would be required. There were some other concerns that have come up in this State as well as all other states. The following are those issues:

- What should be realistically required of the plants to meet the Buy America requirements;
- There are no American producers of steel tie wire for machine tie guns;
- The language being used in the Buy America certifications is inconsistent.
- The producer's certification of compliance does not include a statement that the producer has met the requirements of Buy America.

The team believes these issues will continue to be a national trend and will be carried forward for further consideration of guidance at the completion of the review.

Observations for Potential Improvement:

As previously noted, the team considers FDOT to have a solid program for acceptance of precast elements. The following comments are being provided for FDOT's consideration for potential improvements.

Observation 1:

Drainage Precast Concrete elements do not have many of the good quality assurance procedures that FDOT requires for incidental and pipe precast concrete elements such as:

- Mix Designs are not formally approved, but are said to be approved through approval of the quality control plan;
- There are no testing requirements such as concrete temperature, aggregate moistures, air content, slump, and compressive strength; and
- FDOT does not require a minimum compressive strength to be checked through a cylinder break prior to stripping.

Observation 2:

FDOT requires quality control plans but the requirements are somewhat less rigorous than what is required by third-party certifying organizations. We noted several NPCA-certified plants submitting abbreviated versions of their NPCA QC plan to FDOT. Comprehensive QC plans are the industry standard and it would not be an undue burden on the industry to provide them to FDOT.

Observation 3:

With the notable exception of District 2, FDOT has not provided its field inspectors with training or guidance in acceptance of precast items when they arrive at the project site. Such guidance should include checking for the proper stamp, cracks, broken corners, honeycombing, exposed steel, etc. and could be included in FDOT's Construction and Program Administration Manual in the form of a checklist. We were struck by the comment at the opening meeting that "hopefully the inspectors are checking for those things."

Observation 4:

A significant number of the precast plants in Florida are certified by a third party, typically NPCA. NPCA conducts an annual inspection of each plant and provides a written report identifying any deficiencies and the plant provides a written corrective action plan. In spite of the availability of this information, FDOT plant inspectors are not reviewing this information that could give them additional insight for conducting their own inspections.

Observation 5:

As discussed, we consider the use of pre- and post-pour checklists by QC personnel to be a beneficial aspect of the FDOT acceptance program. However, FDOT has not provided any guidance/requirements on what these checklists must contain or how the information should be documented. We observed substantial variation among the plants of what was included in the checklists and how the checklists were completed.

Observation 6:

FDOT specifications include a provision for a "flowing concrete" mix design, incorporating a target slump of 9 inches plus or minus 1-1/2 inches. As per the suppliers, this is achieved solely through the use of superplasticizers. FDOT requires a mock-up placement to assure the mix is not prone to segregation but we are concerned about the strong likelihood of production processes not mirroring the care taken during the mock-up and poorer quality products being produced as a result. Several suppliers commented on feeling somewhat restrained by FDOT in their efforts to move towards a self-consolidating concrete mix for use in their products.

Observation 7:

FDOT specifications contain a provision allowing for a "high temperature" concrete mix to be placed at mix temperatures up to 100 degrees. As per the suppliers, this mix design is the same as their typical mix with the inclusion of high doses of retarder. We are concerned about the durability of products produced with mixes near 100 degrees as national codes such as ACI and all state specification that we are familiar with limit mix temperature to 90 degrees. In reviewing supplier QC data we noted several plants routinely producing with mixes in excess of 90 degrees.